



TITLE:

# Inter-university Upper atmosphere Global Observation NETwork (IUGONET)

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# IUGONET

Metadata DB for Upper Atmosphere

超高層大気長期変動の全球地上ネットワーク観測・研究  
Inter-university Upper atmosphere Global Observation NETwork

*The First ICSU World Data System Conference, Kyoto (Japan), 5 Sept. 2011  
- Session 6: Application of Information Technologies to Data Systems-*

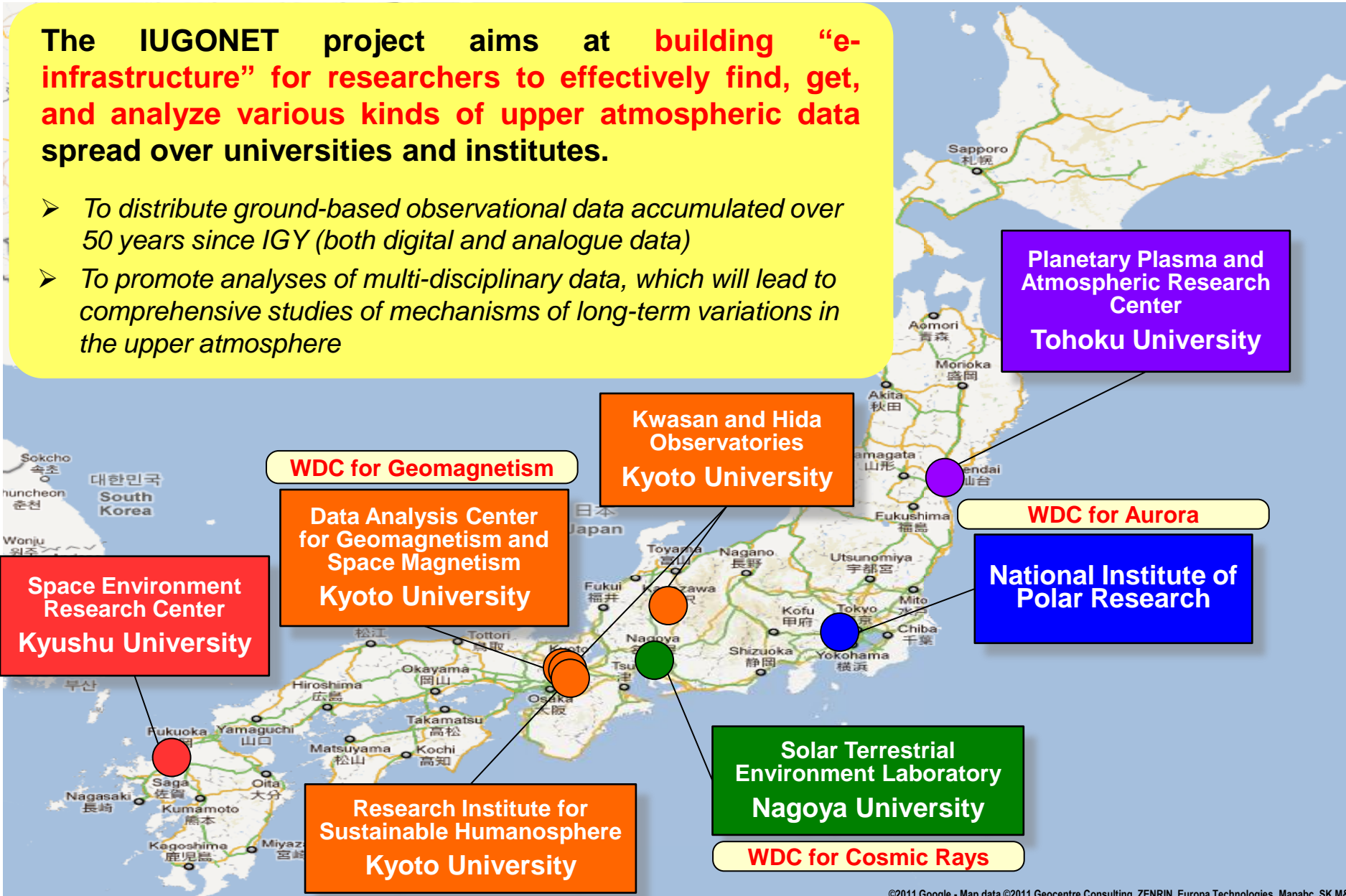
## Inter-university Upper atmosphere Global Observation NETwork (IUGONET)

**H. Hayashi, Y. Koyama, T. Hori, Y. Tanaka, M. Kagitani,  
A. Shinbori, S. Abe, T. Kouno, D. Yoshida, S. UeNo,  
N. Kaneda, M. Yoneda, H. Tadokoro, T. Motoba,  
and IUGONET project team**

# The IUGONET project - Objectives

The IUGONET project aims at building “e-infrastructure” for researchers to effectively find, get, and analyze various kinds of upper atmospheric data spread over universities and institutes.

- To distribute ground-based observational data accumulated over 50 years since IGY (both digital and analogue data)
- To promote analyses of multi-disciplinary data, which will lead to comprehensive studies of mechanisms of long-term variations in the upper atmosphere



IUGONET

# Observations by IUGONET institutions

Svalbard

IS radar (EISCAT)  
meteor radar  
aurora imager



EISCAT Svalbard Radar

Tromsø

IS radar (EISCAT)  
meteor radar  
MF radar

● Optical Observation ▲ Radar Observation ◆ Magnetometer Observation

■ Tohoku Univ. ■ NIPR ■ Nagoya Univ. ■ Kyoto Univ. ■ Kyushu Univ.

Iitate and Onagawa Observatories



Iitate and Onagawa Observatories

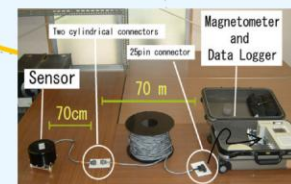
**Various observation parameters (wind, geomagnetism, aurora, sunspot etc.) taken by various techniques in various time periods at various locations and altitudes**

Iceland  
aurora  
magnetometer  
ELF/VLF receiver  
riometer

Equatorial Atmosphere Observatory



Solar Magnetic Activity  
Research Telescope



Two cylindrical connectors  
Sensor  
70cm  
70m  
Magnetometer and Data Logger

**Such observational data not necessarily well used in scientific researches so far**

→ **What's the problem?**

SuperDARN Radar

Syowa Station  
SuperDARN radar x2  
MF radar  
aurora imagers  
magnetometer  
ELF/VLF receiver  
riometer

Peru Ica University



Flare Monitoring Telescope

▲ MST radar  
◆ MF/meteor radar  
◆ MAGDAS magnetometer  
▲ FM - CW radar  
● OMTI imager  
◆ WDC magnetometer  
— Magnetic Equator (IGRF2005, Height 100km)



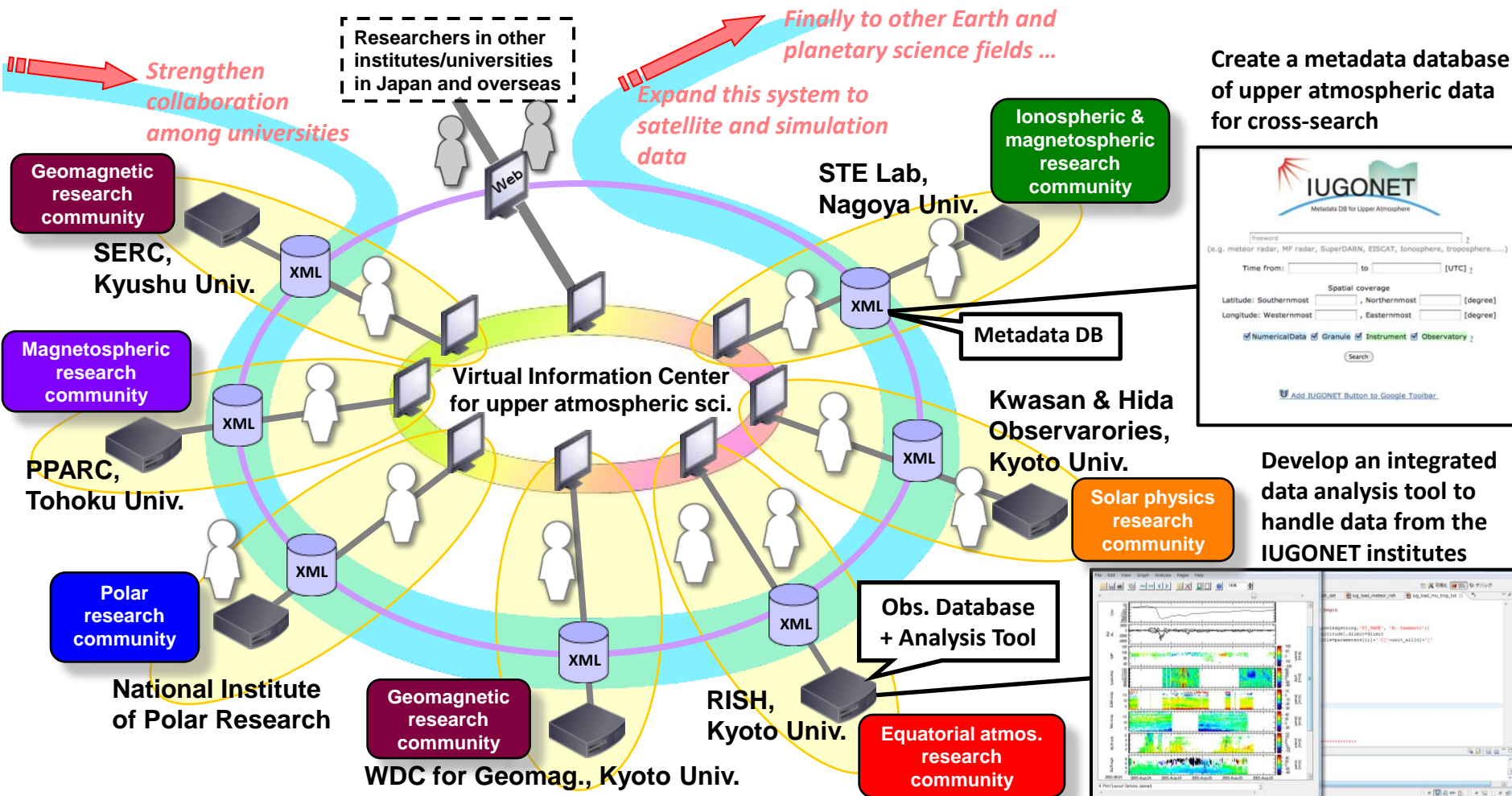
IUGONET

# Project Schematic

**PROBLEM:** Various kind, huge amount of data spread over institutes and universities

**SOLUTION:** Create a metadata database for cross-search of these distributed data

Promote new types of upper atmospheric research by analysis of multi-disciplinary data



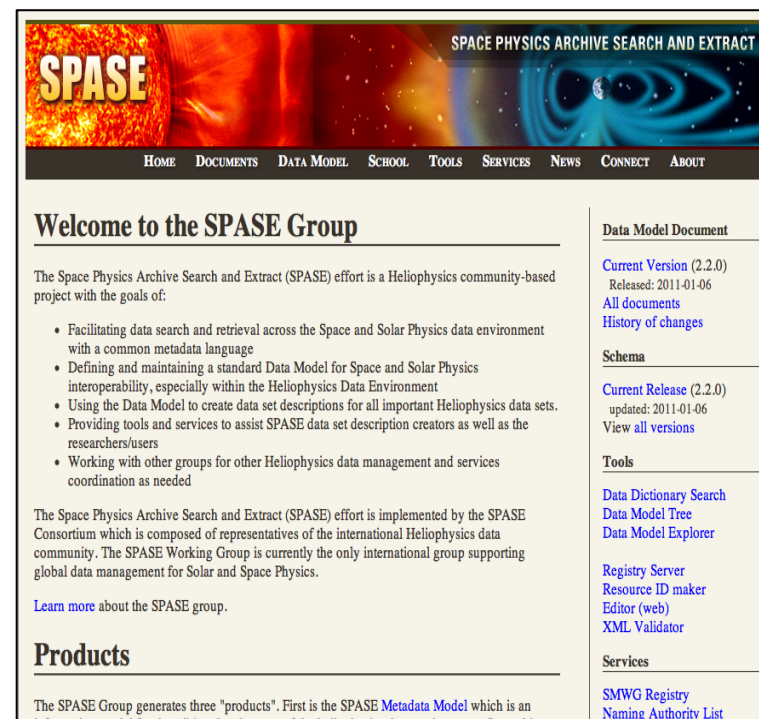


# Design of metadata format

## ● IUGONET adopted SPASE as the base format

developed to describe research resources regarding heliospheric and magnetospheric satellite observations

- **closely related to STP and upper atmospheric researches**  
(→ easy to use as a base format)
- **new metadata elements & words appendable**  
(→ customizable according to our data)
- **widely-used in existing Virtual Observatories**  
(→ possible to exchange metadata)



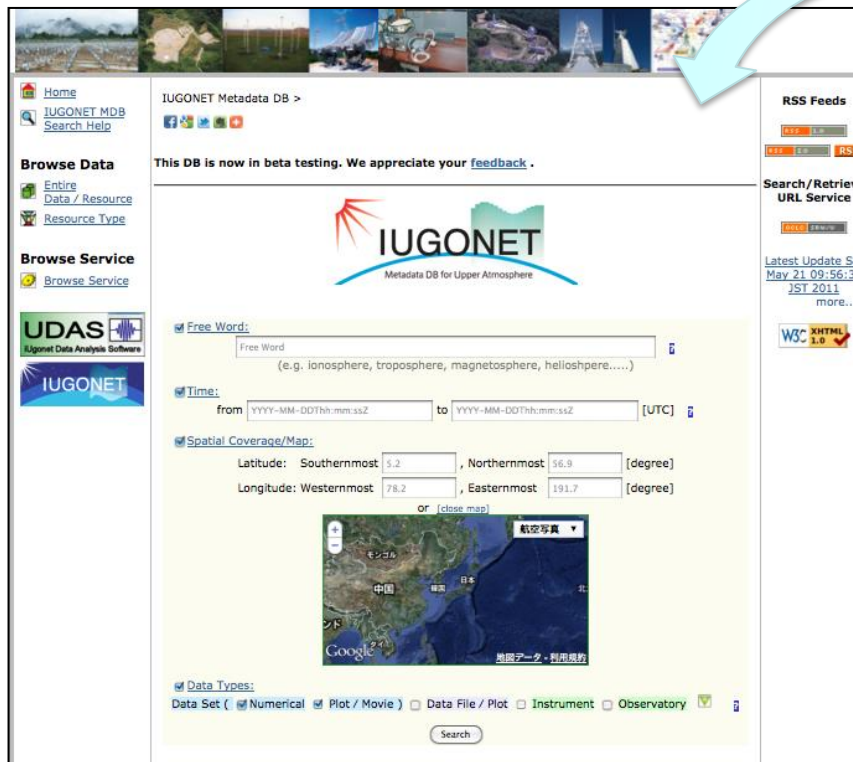
(<http://www.spase-group.org>)



# Development of metadata DB system

## ● IUGONET uses DSpace as the metadata DB platform

- ✓ Free software, widely used by digital repositories in many universities over the world.
- ✓ Including fundamental functions to register, search, provide, and harvest metadata written even in the IUGONET metadata format.



registered

XML

```
<?xml version="1.0" encoding="UTF-8"?>
<space lang="en" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="http://www.iugonet.org/data/schema"
xsi:schemaLocation="http://www.iugonet.org/data/schema
http://www.iugonet.org/data/schema/iugonet.xsd">
  <Version>1.0.0</Version>
  <NumericalData>

  <ResourceID>space://IUGONET/NumericalData/STEL/SuperDARN/
HOK/HFradar/sd_hok_common_ergscdf</ResourceID>
  <ResourceHeader>
    <ResourceName>SuperDARN Hokkaido HF radar, common
mode data distributed by
ERG-SC</ResourceName>
    <ReleaseDate>2009-04-01T00:00:00</ReleaseDate>
    <ExpirationDate>2199-12-31T23:59:59</ExpirationDate>
    <Description>Common mode data generated by SuperDARN
Hokkaido HF radar. Data
. Data files are distributed in the CDF format through ERG-
SC</Description>
    ...
    ...
  </NumericalData>
```

About 2000 metadata of datasets are available for now !



# Metadata DB system – search form

keyword  
search

IUGONET Metadata DB >

This DB is now in beta testing. We appreciate your [feedback](#).

**IUGONET**  
Metadata DB for Upper Atmosphere

☒ **Free Word:**  
  
 (e.g. ionosphere, troposphere, magnetosphere, heliosphere.....)

☒ **Time:**  
 from  to  [UTC]

☒ **Spatial Coverage/Map:**  
 Latitude: Southernmost , Northernmost  [degree]  
 Longitude: Westernmost , Easternmost  [degree]  
 OR [close map]

☒ **Data Types:**  
 Data Set ( ☒ Numerical ☒ Plot / Movie ) ☐ Data File / Plot ☐ Instrument ☐ Observatory

**RSS Feeds**

**Search/Retrieve URL Service**

Latest Update Sat  
 May 21 09:56:34  
 JST 2011  
 more...

W3C XHTML 1.0

time range  
search

spatial coverage  
search





# Metadata DB system – search result

**Datasets that match input keyword(s) are listed !**

Relative Stop Date: 14 days ago (-P14D)  
<http://gemsissc.stelab.nagoya-u.ac.jp/erg/>  
Repository: <spase://IUGONET/Repository/STEL/ERG-SC>  
Instrument: <spase://IUGONET/Instrument/STEL/SuperDARN/HOK>

## The common time fitacf CDF data of SuperDARN King Salmon HF radar distributed by ERG-SC

### *NumericalData*

Common mode data obtained by SuperDARN King Salmon HF radar. Data files are distributed in the CDF format through the ERG-SC repository

Start Date: 2006-12-02T00:00:00

Relative Stop Date: 180 days ago (-P180D)

<http://gemsissc.stelab.nagoya-u.ac.jp/erg/>

Repository: <spase://IUGONET/Repository/STEL/ERG-SC>

Instrument: <spase://IUGONET/Instrument/STEL/SuperDARN/KSR/HFradar>

## Standard observation data of the troposphere and lower stratosphere taken by the MU radar (NetCDF format)

### *NumericalData*

The 10-minute average observation data in the NetCDF (Network Common Data Form) format taken by the MU radar at Shigaraki in the Shiga prefecture, Japan (34.85N, 136.10E, 385m MSL), which has been operated in the standard observation mode of the troposphere and stratosphere. The observation data are stored in the NetCDF files of each day. The file name is (year)(month)(day).nc. The NetCDF data include range, height, time, three components of wind velocity, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. The azimuth and zenith angles of beam 1, 2, 3, 4 and 5 are (0, 0), (0, 10), (90, 10), (180, 10) and (270, 10), respectively, in unit of degree. The value of 1.0e+10 means missing data.

Start Date: 1986-03-16T15:05:00

Relative Stop Date: 14 days ago (-P14D)

<http://www.rish.kyoto-u.ac.jp/radar-group/mu/data/>

Repository: <spase://IUGONET/Repository/RISH/RISHDB>

Instrument: <spase://IUGONET/Instrument/RISH/misc/SGK/MUradar>

## Field-aligned irregularity (FAI) observation data of the ionosphere taken by the EAR (NetCDF format)

### *NumericalData*

The field-aligned irregularity (FAI) observation data in the NetCDF (Network Common Data Form) format taken by the equatorial atmosphere radar (EAR) at Kototabang, Indonesia (0.20S, 100.32E, 865m MSL). This FAI observation mode covers a wide altitude range from 80 to 600 km in the ionosphere (D-region (below 90 km), E-region (90-150 km), and F-region (above 150 km)). The observation data are stored in the NetCDF files of each day and observation parameter. The file name is (year)(month)(day).(observation parameter).nc. The NetCDF data include range, height, time, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. Details of the observation parameter are described in the EAR-FAI homepage (<http://www.rish.kyoto-u.ac.jp/ear/data-fai/index.html>). The value of 1.0e+10 means missing data.



# Metadata DB system – detailed metadata

## Description:

The 10-minute average observation data in the NetCDF (Network Common Data Form) format taken by the equatorial atmosphere radar (EAR) at Kototabang, Indonesia (0.203S, 100.320E, 865m MSL), which has been operated in the standard observation mode of the troposphere and stratosphere. The observation data are stored in the NetCDF files of each day. The file name is (year)(month)(day).nc. The NetCDF data include range, height, time, three components of wind velocity, radial Doppler velocity, echo power, spectral width and noise level for each beam number and so on. The azimuth and zenith angles of beam 1, 2, 3, 4 and 5 are (0, 0), (0, 10), (90, 10), (180, 10) and (270, 10), respectively, in unit of degree. The value of 1.0e+10 means missing data.

## Acknowledgement:

If you acquire EAR data, we ask that you acknowledge us in your use of the data. This may be done by including text such as EAR data provided by Research Institute for Sustainable Humansphere of Kyoto University.

## ReleaseDate:

2011-05-06T00:00:00

## Contact PersonID:

0: [space://IUGONET/Person/Hiroiyuki.Hashiguchi](mailto:space://IUGONET/Person/Hiroiyuki.Hashiguchi)  
1: [space://IUGONET/Person/EAR.Management.Group](mailto:space://IUGONET/Person/EAR.Management.Group)  
2: [space://IUGONET/Person/Noriko.Hashiguchi](mailto:space://IUGONET/Person/Noriko.Hashiguchi)  
3: [space://IUGONET/Person/RISH.Metadata.Management.Group](mailto:space://IUGONET/Person/RISH.Metadata.Management.Group)

## Contact Role:

0: PrincipalInvestigator  
1: GeneralContact  
2: DataProducer  
3: MetadataContact

## AccessInformation RepositoryID:

[space://IUGONET/Repository/RISH/RISHDB](mailto:space://IUGONET/Repository/RISH/RISHDB)

## AccessInformation AccessURL URL:

<http://www.rish.kyoto-u.ac.jp/ear/data/index.html>

## AccessInformation Availability:

Online

## AccessInformation AccessRights:

Open

## AccessInformation Format:

NetCDF

Description of data

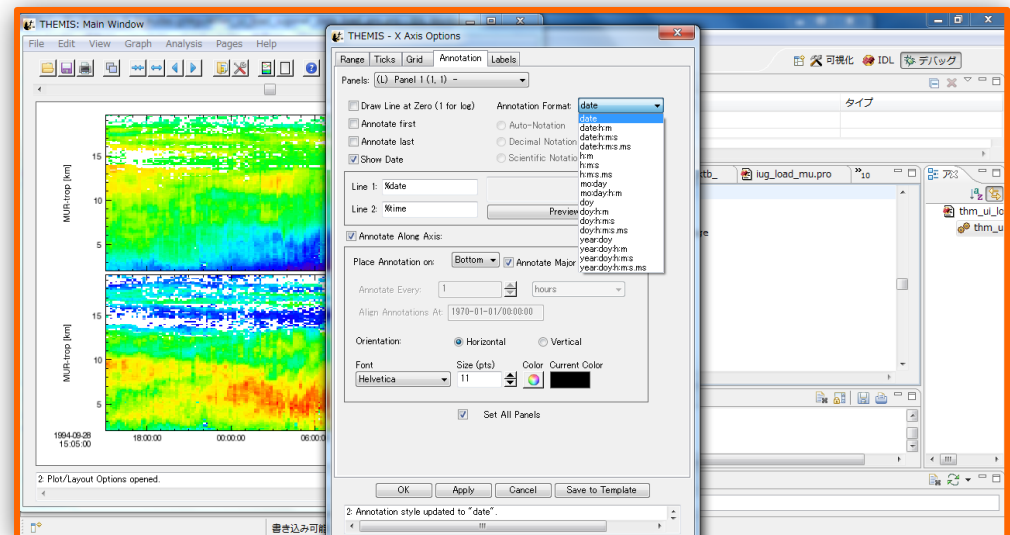
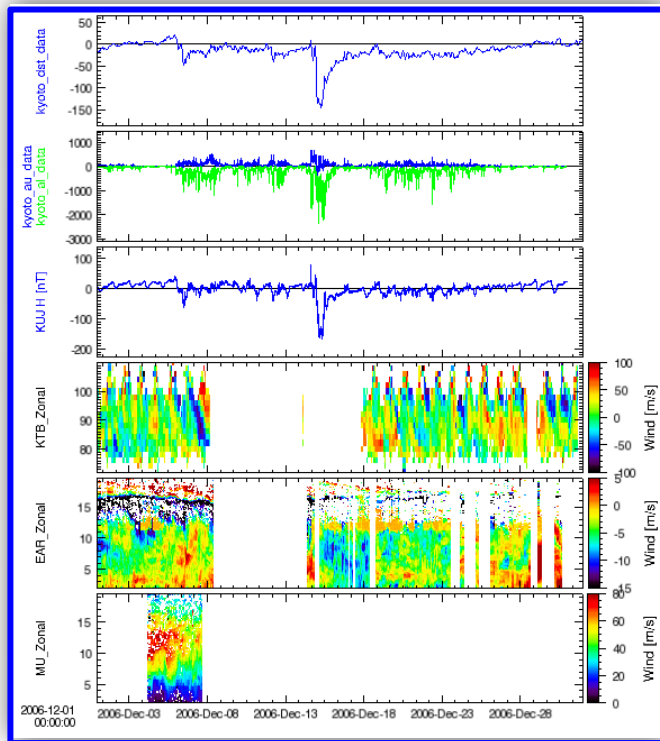
Jump to metadata of “person”  
(e-mail address, etc.)

Information of  
data access

- **To help users easily download, visualize, and analyze various data provided from us**

## Able to make stacked plots of time series to compare various kind of data

## Easy to handle data even for those who are not familiar with the data by using GUI





# Project timeline

ITEMS		FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	REMARKS
Virtual Information Center	Installation & stable operation	Install system —————→			Update system			Construct the integrated research environment (video and/or web conference system, etc.)
	Extension to other disciplines						—————→	Wrap up the project and discuss further extension of the system to other discipline
Metadata DB system	Development	Make prototype —————→	Develop regular system	Release product to public				Design and build the IUGONET metadata DB system on the basis of DSpace
	Stable operation				Update computers		—————→	Conduct regular operation of the metadata DB and customize it as needed
Metadata	Design of metadata format	Release ver.1 format —————→	Prepare documents —————→	Update format as needed ----->				Formulate the IUGONET common metadata format and keep updating it if necessary
	Creation of metadata			Open metadata thru metadata DB	Target relatively old, undatabased items —————→			Create metadata in the designated format and register them in the metadata DB system
Analysis Software	Survey & Specification of analysis software	Specification —————→	Prepare documents —————→					Design an integrated analysis software to download, visualize, and analyze data provided from the IUGONET institutions
	Programming			Release product to public	Target relatively old, undatabased items —————→			Develop the IUGONET analysis software by using TDAS (a set of IDL subroutines)
Others	Rearrangement of observational DBs		Rearrange DBs corresponding to metadata & software development —————→					Rearrange existing observational DBs and newly compile DBs of undatabased items
	Scientific researches			Conduct scientific researches with the IUGONET products ----->				Do interdisciplinary researches using various data from the IUGONET institutions
	Management of project website	Build project homepage —————→						Provide project information to the public through the website

Today





# Release of IUGONET products

The IUGONET metadata database and analysis software have been released for **beta-testing** !

<http://search.iugonet.org/iugonet>

<http://www.iugonet.org/en/software.html>

### UDAS (IUGONET Data Analysis Software)

[日本語版](#) [Japanese Version](#)

#### Topics

- UDAS v1.00.b1 was released on May 13, 2011. → [Download UDAS](#)

#### What is UDAS?

We provide users with IUGONET Data Analysis Software (UDAS) to read and analyze ground-based observational data opened individually by [each institution in the IUGONET project](#).

- UDAS is a plug-in software of [THEMIS Data Analysis Software suite \(TDAS\)](#), which has many useful routines to visualize and analyze time series data.
- It accesses the IUGONET data through the internet, and then the data are automatically downloaded onto the user's computer. Users can get and analyze the data without any concerns about data locations.
- The loaded data and/or plots can be exported to a variety of data format (ASCII, PNG, JPEG, PS, EPS, etc.).
- GUI (Graphical User Interface) as well as the CUI (Character User Interface) is supplied for beginners.
- Even users who do not have the IDL commercial license will be able to use the GUI-based UDAS on the IDL Virtual Machine\* (Under development)

\* The IDL Virtual Machine is a freely distributed, cross-platform utility for running compiled IDL codes. The IUGONET project will distribute compiled IDL codes of the data analysis software.

#### Getting started

[View screenshots](#)  
[List of load procedures and corresponding IUGONET observations](#)

**Download UDAS**

iUgonet Data Analysis Software

#### Data Policy

When you use the IUGONET data, please check the data policy for each data set. The data policy will be displayed in the console, when you run the load procedures on IDL. It is also possible to search the data policy at [the IUGONET Metadata Database](#).

#### Collaborations

➤ We welcome your feedback



# Summary

- **The IUGONET project** (<http://www.iugonet.org>) builds **metadata database** and **analysis software** to promote effective use of upper atmospheric data taken by various ground-based observations.
- **The IUGONET products have been beta-released!**
  - Metadata database : <http://search.iugonet.org/iugonet/>
  - Analysis software : <http://www.iugonet.org/en/software.html>
- **The IUGONET plans to exchange metadata with other similar organizations/projects for different types of data. We also would like to collaborate with other disciplines to build more comprehensive system.**